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## Estimating Passenger Demand Trends and Passenger Characteristics along Raml Tram

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## CASE STUDY

# Estimating Passenger Demand Trends and Passenger Characteristics Along the Raml Tram

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## Abstract

The main objective of this paper is to estimate the current passenger demand trends and passenger perception of Raml Tram use. To undertake this task it was needed to conduct passenger count in addition to undertaking passenger survey along Raml Tram. The main conclusions of this research show that the maximum number of passengers in summer is 373 compared with the corresponding value which is 420 passengers in school time for the Bakous line. Similarly, the maximum number of passengers in summer is 279 compared with the corresponding value, which is 347 passengers in school time for the Bakous line. This indicates that in summer time there is a reduction in demand on using the transit facility compared with school days. This is due to the fact that during the summer vacation, there is less demand generally for using Raml Tram. In general, the passenger demand along the Bakous line decreased by 11%, while the El Nasr line decreased by 19% during the summer.

**Keywords:** Passenger characteristics, Passenger demand, Tram

## 1. Introduction

**P**aper scope and tram characteristics and description.

The Alexandria Tram Network began operating in 1863. The system was electrified in 1902. It was the first and the largest mass transport in Africa. The whole network is about 32 km of tracks and serves about 140 stops in streets of east, center, and west Alexandria (Egis, 2022).

Raml Tram is mainly operated by multiple units including double-deck trams. Raml Tram is one of only a few tram systems in the world that uses double-deck cars.

The system is a 1.435 mm standard gauge. Fig. 1 shows the Raml Tram current lines.

Currently, there are three lines operated from Raml station to Victoria:

- (1) El Raml – El Nasr (red line).
- (2) El Raml – El Nasr (blue line – Baccos).

- (3) El Raml – San Stefano (green line).

Boarding and Alighting survey was the chosen technique to draw an understanding of the transit line load profile (Chowdhury et al., 2015; Cascajo et al., 2017) to determine the maximum number passengers using the tram line in each section along its route (Currie, 2005).

The survey depends on assigning a surveyor to each of the tram doors recording the number of boarding and alighting passengers at each station, the difference between the two numbers added to the number of passengers carried from the previous station determines the number of passengers using the section between the current station and the following one (Domencich and McFadden, 1975; Hensher, 1994). For example, if the tram starts with 12 passengers in one vehicle from its first station, then reaches the next station where three passengers exited the tram and five passengers boarded this will result in 14 passengers continuing to the

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Fig. 1. Current stations for Alexandria El-Raml Tram.

next station. This process is repeated for each trip along each tram line.

The survey was conducted alongside the traveler information survey onboard the tram lines, Bakous, El Nasr, and yellow line. The survey covered 2 days Wednesday May 10, 2023 and Thursday May 11, 2023, and was amended by 4 days Sunday 16th, Monday 17th, Tuesday 18th, and Wednesday July 19. The survey covered trips in both directions from El Raml station to Victoria station (eastbound) and from Victoria to El Raml (westbound). Each direction was observed several times to identify the peak volume(s) of the passengers.

Several observations were concluded from the surveys conducted over different times of the day, the direction of travel, days of the week, and also over two different months of the year, which represent the school days and summer vacation times of the year.

## 2. Tram passenger trends

Data has been collected from Alexandria Governorate's Public Passenger Transport Agency for the number of passengers of the tram during the period 2018–2022.

Figure 2 indicated that the highest average daily number of passengers for the Raml Tram was recorded in 2018 with 137,061 passengers/day, while 2020 and 2021 recorded the lowest average with about 82,604 and 93,376 passengers/day for the previous years, respectively. This reduction in the number of passengers due to the coronavirus disease 2019 pandemic as the year 2018 was the last year on record before the effects of coronavirus disease 2019 started affecting the world economy, and because of precautionary measures. In addition, Alexandria is a coastal city so part of its economy was heavily affected by the decrease in the volume of maritime trade. Then the number of passengers will rebound as the economic activities of the city start recovery.

The average percentage of passengers in line 33 represented about 5.5% of Raml Tram passengers during 2020–2022, while the average percentage of passengers in line 34 represented about 2.3% of Raml Tram passengers during 2020–2023.

During March–June 2022 the line 1 share percentage of passengers in line 1 was about 48.8% and the share of line 2 was 40.5%, while the share of line 33 was about 6.74% and line 34 was 3.9% as shown in Fig. 3.

## 3. Public transportation modes available in the study area

A data collection survey was conducted with the Alexandria Passenger Transportation Authority,

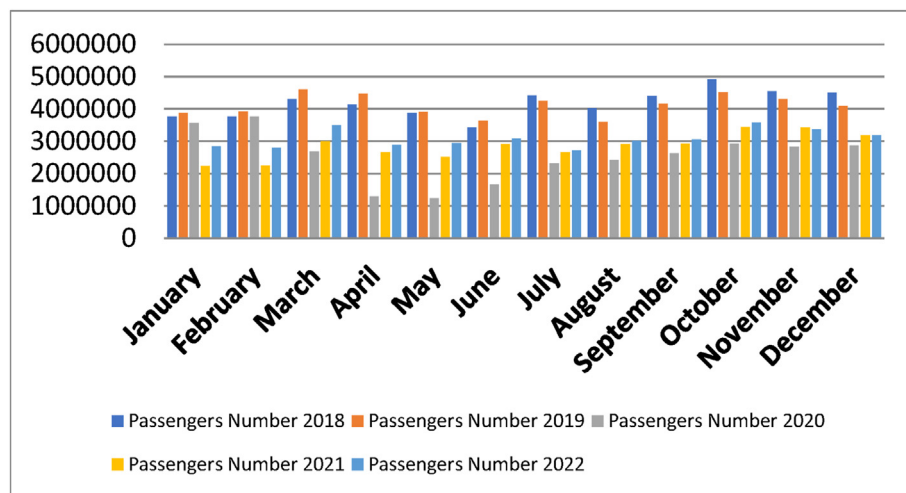


Fig. 2. Distribution of Raml Tram passengers during s 2018–2022 (Agency, 2021). Source: Alexandria Governorate's for Public Passenger Transport Agency Data (Alexandria Governorate).

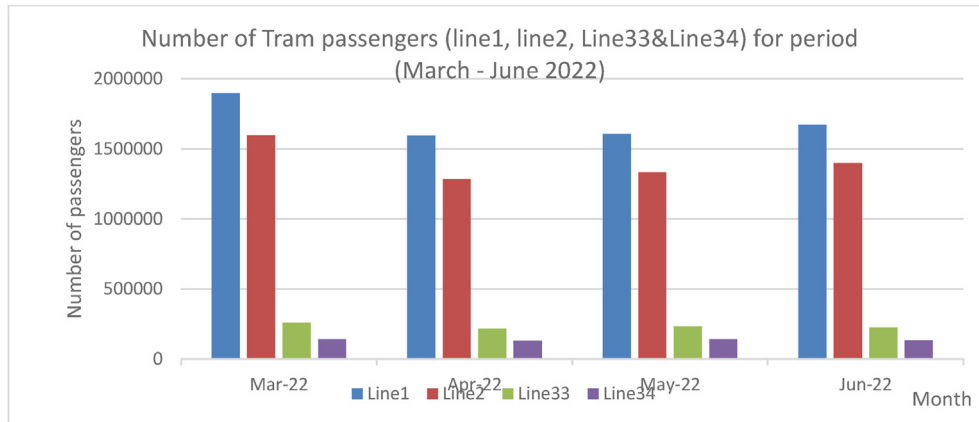


Fig. 3. Number of tram passengers (line 1, line 2, line 33, and line 34) for March–June 2022. Source: Alexandria Governorate's for Public Passenger Transport Agency Data (Alexandria Governorate).

which resulted in summarizing the transit lines operating parallel to Raml Tram lines, such lines range from double-decker buses (nominal capacity of 90 passengers), full-sized buses (nominal capacity of 65–70 passengers) to smaller mini buses (nominal capacity of 35–40 passengers) divided as follows:

#### 4. Boarding and alighting survey methodology

Boarding and alighting survey was the chosen technique to draw an understanding of the transit line load profile, to determine the maximum number of passengers using the tram line in each section along its route.

The survey depends on assigning a surveyor to each of the tram doors recording the number of boarding and alighting passengers at each station. The difference between the two numbers added to the number of passengers carried from the previous station determines the number of passengers using the section between the current station and the following one. For example, if the tram starts with 12 passengers in one vehicle from its first station, then reaches the next station where three passengers exit the tram and five passengers board resulting in 14 passengers who will continue to the next station. This process is repeated for each trip along each tram line.

The survey was conducted alongside the traveler information survey onboard the tram lines, Bakous, El Nasr, and yellow line. The survey covered 2 days Wednesday May 10, 2023 and Thursday May 11, 2023, and was amended by 4 days Sunday 16th, Monday 17th, Tuesday 18th, and Wednesday July 19. The survey covered trips in both directions from El Raml station to Victoria station (eastbound) and from Victoria to El Raml (westbound). Each direction was observed several times to identify the peak volume(s) of the passengers.

Several observations were concluded from the surveys conducted over different times of the day, direction of travel, days of the week, and also over two different months of the year, which represents the school days and summer vacation times of the year. Results will be discussed in detail in the following paragraphs.

Figures 4 and 5 represent several trips observed in the survey, the grey and blue lines represent the highest trip volumes observed that day in the direction of El-Raml to Victoria (eastbound), showing that the passengers on each section of the tramline increase till they reach the area of stations Al Wizara, Fleming, and Bakous. Then the passenger load starts decreasing till the end of the line at Victoria station. For Victoria to El-Raml direction a similar trend will be observed, where the passenger load increased till the stations of Camp Chezar and the university.

The maximum number of passengers were observed on Thursday during the afternoon peak operation with the highest section carrying 420 passengers. Fig. 6 summarizes the observation of the survey during the school operation days with maximum, average, and minimum number of passengers at each section of the Bakous line with 420 as the maximum number of passengers using a single tram of the tram line, with an average trip time of 1 h and 20 min and two observed trams per hour. The estimate of the maximum number of passengers using the Bakous line is 840 passenger per hour.

Similarly, Figs. 8–10 represent the same data for the El Nasr line, with the maximum carrying section peaking at 347 passenger per tram per hour. Thus with an average trip time of 1 h and 20 min and two observed trams per hour, the estimate of the



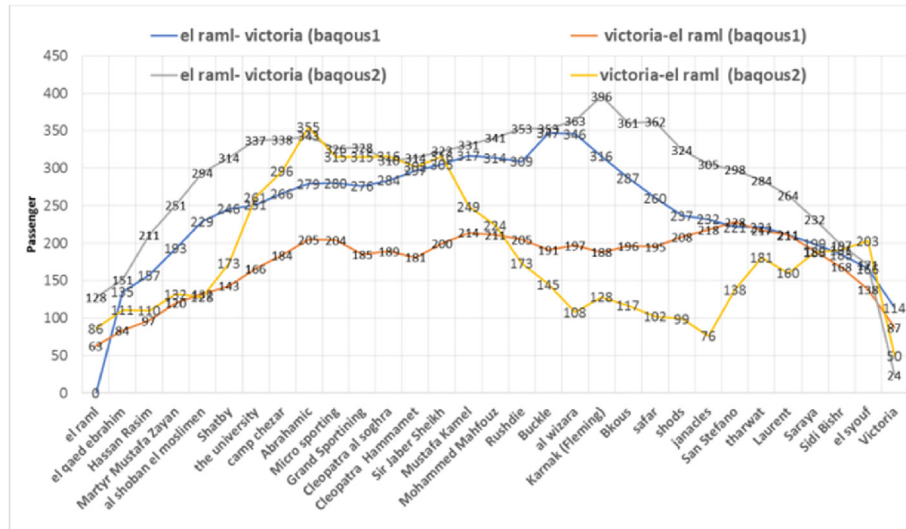


Fig. 4. Bakuos Tram first survey day – school time. Source: Conducted Survey.

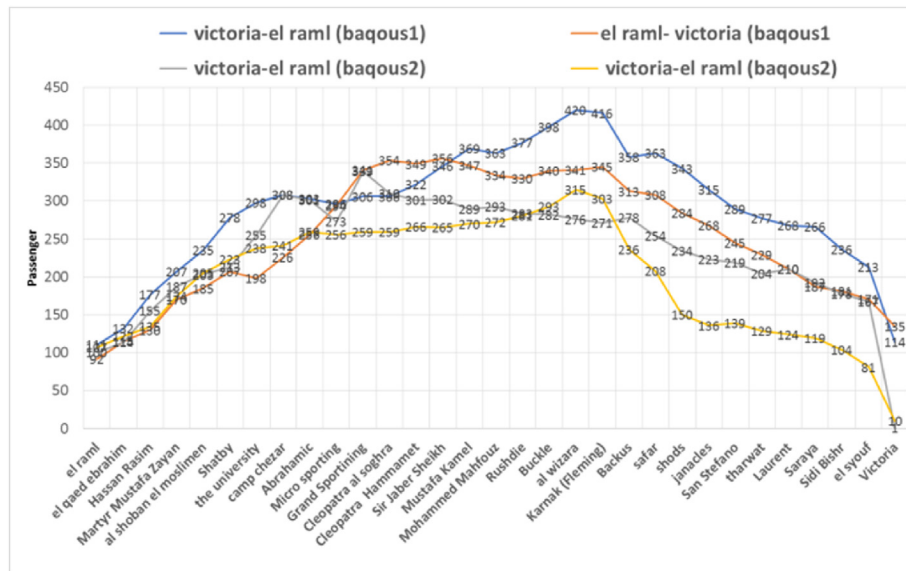


Fig. 5. Bakuos Tram second survey day – school time. Source: Conducted Survey.

maximum number of passengers using the El Nasr line is 694 passenger per hour.

Figures 7 and 11 represent a map showing the typical load profile of both Bakous and El Nasr line consecutively. These two figures show that the stations toward the middle of the lines are more loaded than the terminal stations and also the Bakous line is about 17% more loaded than the El Nasr line.

Boarding and alighting survey was repeated in July to understand the difference in the demand between summer and winter time, and it was concluded that the passenger count repeated in the summer days shows a maximum number of passengers equal to 373 passengers per tram per direction for the Bakous line and 279 passengers per

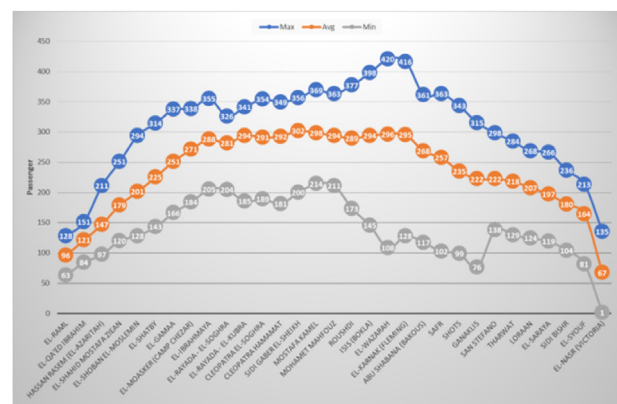


Fig. 6. Maximum, minimum, and average of passengers per station for the Bakous line during school days. Source: Conducted Survey.

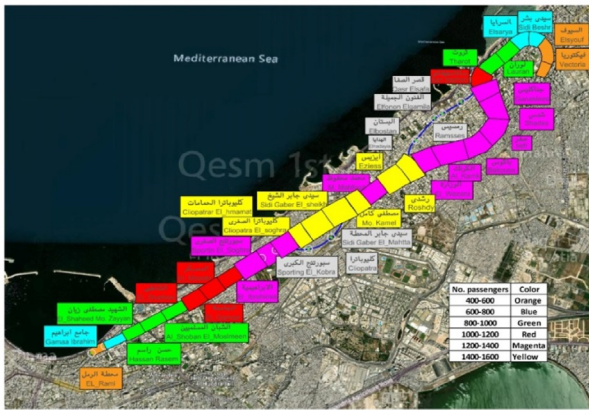


Fig. 7. Bakous line passenger load profile map during school days. Source: Conducted Survey.

tram per direction for the El Nasr line. So, the maximum number of passengers in summer is 373 compared with the corresponding value, which is 420 passengers in school time for the Bakous line. Similarly, the maximum number of passengers in summer is 279 compared with the corresponding value, which is 347 passengers in school time for the Nasr line, meaning that the peak demand occurs during school days. This indicates that in summer time there is a reduction in the demand for using the transit facility compared with school days. This is because during the summer vacation there is less demand generally for using the Raml Tram. In general, the passenger demand along the Bakous line decreased by 11%, while the El Nasr line

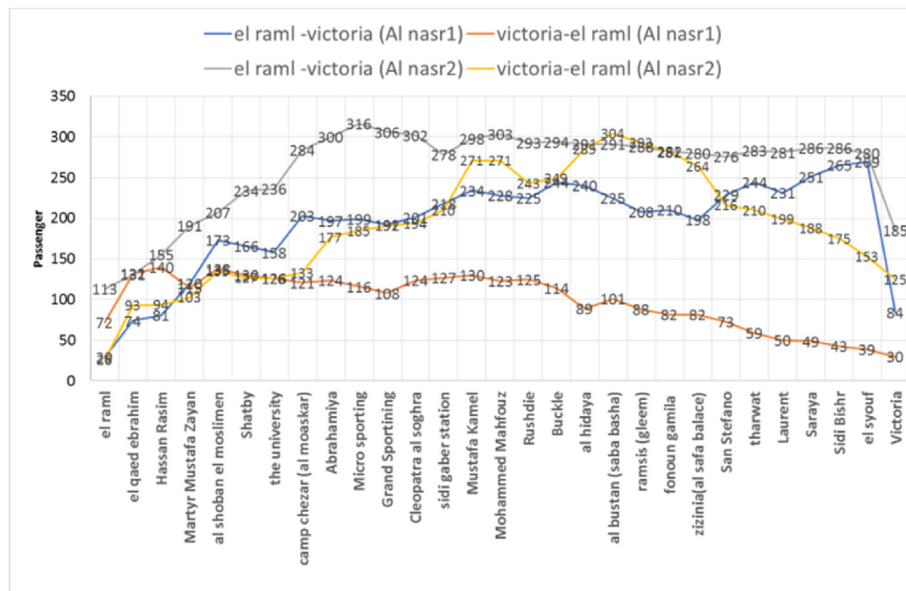


Fig. 8. Al-Nasr Tram first survey day – school time. Source: Conducted Survey.

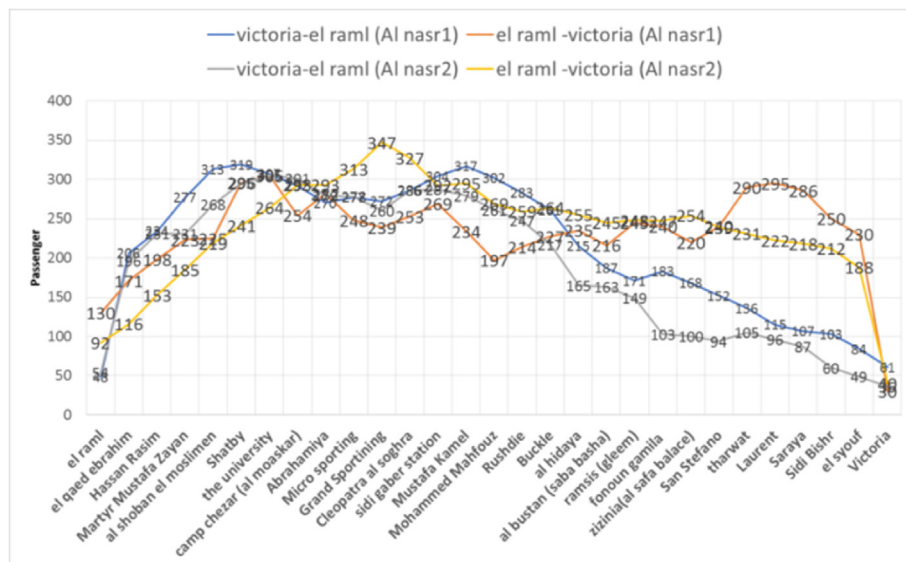


Fig. 9. Al Nasr Tram second survey day – school time. Source: Conducted Survey.

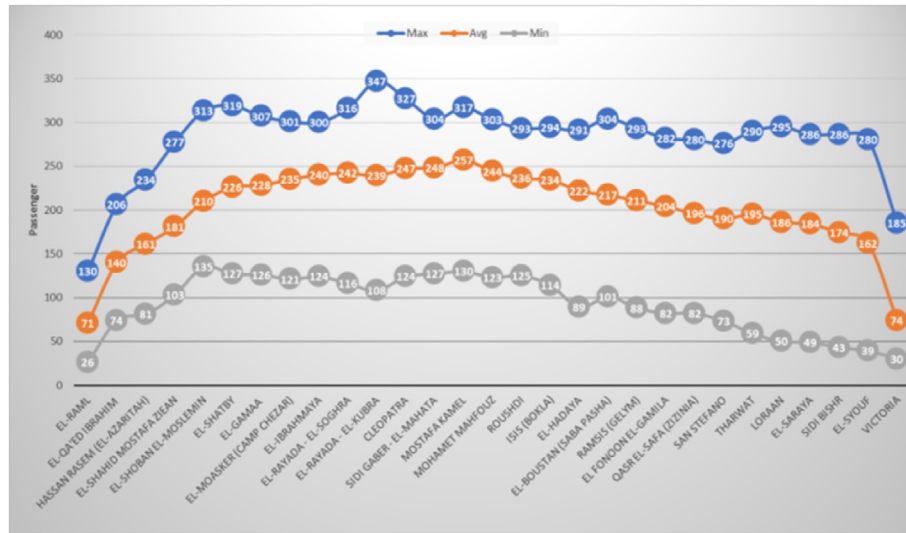


Fig. 10. Maximum, minimum, and average of passengers per station for the Al-Nasr line. Source: Conducted Survey.

decreased by 19% during the summer. Figs. 12 and 13 show the counting results during the survey conducted in July 2023.

## 5. Passenger characteristics survey results

Parallel with the boarding and alighting passenger count, a survey with Raml Tram passengers was undertaken on two consecutive days, Wednesday and Thursday (May 3–4, 2023) during daily peak and off-peak periods. These two consecutive days were chosen to identify the trends during a weekday and compared with the trend during the end of the weekdays, because it was observed from the pilots and collected data that the peak number of passengers occurs during the end of weekdays.

The survey took place on board the tram on the Nasr line and Bakous line in addition to the yellow

line from El-Raml to San Stefano and a total of 831 survey sheets were filled (280 sheets on the Nasr line, 349 sheets on the Bakous line, and 202 sheets on the yellow line). The survey format is presented in the appendix.

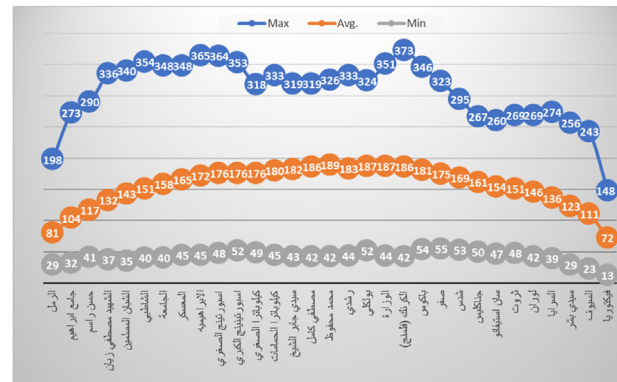


Fig. 12. Maximum, minimum, and average of passengers per stations in the Bakous line during the survey conducted in July 2023. Source: Conducted Survey.

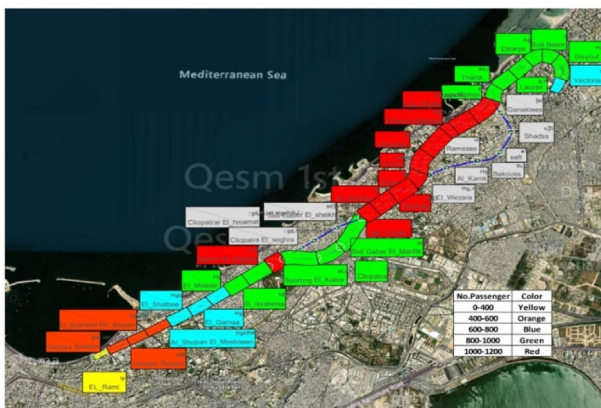


Fig. 11. Al-Nasr line passenger load profile map. Source: Conducted Survey.

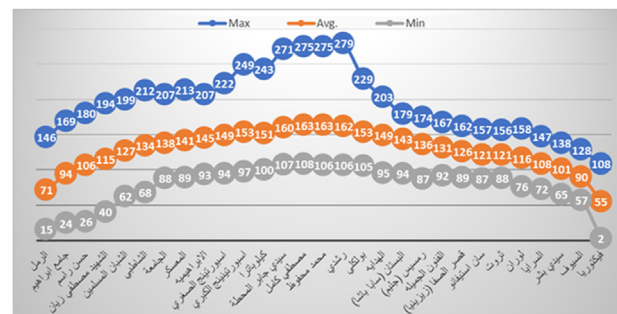


Fig. 13. Maximum, minimum, and average of passengers per Station in the Nasr line during the survey conducted in July 2023. Source: Conducted Survey.



The percentage of surveys conducted during AM is 66% and PM is 34%.

The survey included the following information:

- (1) Current journey on El-Raml Tram such as journey origin and destination, journey time, fares, etc.
- (2) Alternative mode of transport used by passengers if they do not use the tram.
- (3) Journey purpose and reasons for passenger preference of using tram as their mode of transport.
- (4) Socioeconomic characteristics of passengers such as their income, age, and car ownership.

### 5.1. Analysis of Raml Tram survey for Nasr line

Concerning journey origin and destination of Nasr Tram passengers, the following matrix, [Table 1](#), shows the origin and destination of each trip and the number of passengers using each station. As illustrated in [Table 2](#), El Raml, Sidi Gaber, and Victoria were found to be the main origin and destination stations. The average distance traveled by each passenger is 5 km.

- (1) The average journey time of the Nasr line is 22 min, and the average fare is 4.01 LE. Of the passengers, 41% use another mode of transport to complete their journey while 53% of the passengers use the tram only.
- (2) With regard to the transport mode used as a complementary mode, shared taxi represents the main mode with 67.34%, followed by mini bus (17.4%) and buses (5.4%).
- (3) Regarding the alternative means of transport used by Nasr Tram passengers, 18% use private transport and 55% used shared taxis, and 14% use public transport such as buses and mini buses.
- (4) If the passengers use shared taxis, their average fare is 3.92 LE and the average journey time is 22 min as given by the passenger response to

the survey. If the passengers use buses, their average fare is 4.91 LE and the average journey time is 39 min from the passenger's perspective. If the passengers use mini buses, their average fare is 4.72 LE, and the average journey time is 23 min as given by passengers.

- (5) The main journey purpose is work or educational purposes with 62% of the total number of passengers using the tram for work or educational purposes, 6.7% for shopping, 10.67% for family visits, and 11.8% for other purposes.
- (6) Most of the passengers use the tram daily (57.5%) and 24.29% of the passengers use the tram a week; 3.57% of the passengers use the tram monthly and annually and 11% of the passengers gave no answer.
- (7) With respect to the passengers who use the tram heavily, 70% of the daily commuters use the tram twice a day, and 54.36% use the tram twice a week. This trend is repeated for passengers who use the tram monthly and annually with 90% of the passengers who use the tram monthly using it twice a month and 70% of the passengers who use the tram annually using it twice a year.
- (8) The main reason for preferring to use the tram is because it is convenient, followed by the fact that it is cheaper, then the fact that it is close to the origin and destination.
- (9) Regarding socioeconomic data of El-Nasr Tram passengers, most of the riders are females (72%); males represent 28%.
- (10) The age structure of passengers is 22.14% less than 20 years of age, 27.86% is of 21–30 years, 12.5% is of 31–40 years, 11.43% is of 41–50 years, 10% is of 51–60 years, and 10.71% is more than 60 years of age. This is because most of the passengers are in the education stage.
- (11) Of tram passengers, 7.86% are governmental employees, 18.93% are private sector employees, 30.71% are university students, 8.21%

Table 1. Summary of the public transportation lines operating in or close to the study area.

Bus type	Number of lines	Number of buses in operation	Lines number
Double-decker bus	1	8	20
Electric air-conditioned lines	3	28	11-25-40
Air-conditioned buses	4	28	13-45-31-44
Regular buses, operating on Kornish road	15	54	208-220-221-245-252-260-280-288-739-768-771-270-290-810-850
Regular buses, operating on Abu quier road	6	16	218-238-232-236-244-738
Mini buses	3	10	731-733-740
Total	32	144	–

Source: Alexandria Governorate's for Public Passenger Transport Agency Data ([Alexandria Governorate](#)).

Table 2. Origin destination matrix of passenger kilometer using tram-Nasr line.

Row labels	El-Boustan (Saba Pasha)	Ramsis (Gelym)	El Fonoon El-Gamila	Qasr El-Safa (Zizinia)	San Stefano	Tharwat	Loraan	El-Saraya	Sidi Bishr	El-Syouf	Victoria	Total
El-Raml	390 6900	490 7390	160 7550	370 0	450 25,110	240 0	350 0	340 9300	250 9550	240 9790	350 30,420	10140 139,270
El-Qa'ed Ibrahim	0	0	0	0	0	0	0	0	0	0	0	4610
Hassan Rasem (El-Azaritah)	0	0	0	0	0	0	0	0	0	0	0	26,790
El-Shahid Mostafa Ziean	0	0	0	0	0	0	8960	0	0	0	0	8960
El-Shoban El-Moslemin	0	7390	0	0	0	0	0	0	0	0	10,140	21,610
El-Shatby	0	0	0	0	0	0	8960	0	0	0	0	48,270
El-Gamaa	0	0	0	0	0	0	0	0	0	0	0	6770
El-Moasker (Camp Chezar)	0	0	0	0	0	0	0	0	0	0	0	37,580
El-Ibrahmaya	0	7390	0	0	0	0	0	0	0	0	10140	34,070
El-Rayada-El-Soghra	0	0	0	0	0	0	0	0	0	0	0	2160
El-Rayada-El-Kubra	0	7390	0	0	0	0	0	0	0	0	0	12,960
Cleopatra	0	0	0	0	8370	0	0	0	0	0	20,280	39,280
Sidi Gaber-El-Mahata	13,800	29,560	0	0	0	0	0	0	0	9790	20,280	133,450
Mostafa Kamel	0	7390	0	0	8370	0	0	0	19,100	0	40,560	93,730
Mohamet Mahfouz	0	0	0	0	0	0	0	0	0	0	0	5500
Roushdi	0	0	0	0	0	0	0	0	0	0	0	20,850
Isis (Bokla)	0	0	0	0	0	0	0	0	0	0	40,560	55,360
El-Hadaya	0	0	0	0	0	0	0	0	0	0	0	7120
El-Boustan (Saba Pasha)	0	0	0	0	8370	0	0	0	0	0	10,140	54,750
Ramsis (Gelym)	0	0	0	0	0	8610	0	0	0	0	10,140	42,510
El Fonoon El-Gamila	0	0	0	0	0	0	0	0	9550	0	0	17,100
Qasr El-Safa (Zizinia)	0	0	0	0	0	0	0	0	0	0	0	7470
San Stefano	0	14,780	0	0	0	0	0	0	0	0	0	55,960
Tharwat	0	0	0	0	0	8610	0	0	0	0	20,280	38,110
Loraan	0	0	0	0	0	0	0	0	0	0	0	4610
El-Saraya	0	0	0	0	0	0	0	0	0	0	0	0
Sidi Bishr	6900	7390	0	7920	0	8610	0	0	0	0	0	64,200
El-Syouf	13,800	7390	22,650	0	0	0	0	0	0	0	10,140	87,430
Victoria	41,400	59,120	0	31 .680	33,480	0	0	0	19,100	0	0	287,930
Total	82,800	155,190	30,200	39,600	83,700	25,830	17,920	9300	57,300	19,580	223,080	1,358,410

Source: Conducted Survey by researchers.

are school students (i.e. 38.9% of the passengers are students and 12.14% are jobless).

- (12) With respect to the monthly income, 17.5% of the passengers have income less than 1000 LE, 16.4% of the passengers have income between 1001 and 2000 LE, 11.1% of the passengers have income between 2001 and 3000 LE, 9.6% of the passengers have income between 3001 and 4000 LE, 3.9% of the passengers have income between 4001 and 5000 LE, 2.5% of the passengers have income between 5001 and 6000 LE, and 1.4% of the passengers have more than 6000 LE. The rest of the passengers did not answer this question. The number of passengers in the low-income group relates to the fact that most of them are governmental employees.
- (13) Of Nasr Tram passengers, 7.14% own a car, while 87.14% do not own cars, and hence they may be forced to use the public transport.

## 5.2. Analysis of Raml Tram survey for Bakous line

The analysis showed that the highest number of passengers were coming from Abu Shabana (Bakous) station with 14%, and also El-Raml station with a percentage of 14%, the El-Nasr (Victoria) station showed a percentage of 11%. It was found also that the highest destination stations in terms of the number of passengers were Abu Shabana (Bakous) station with a percentage of 14%, followed by El-Raml station with a percentage of 11%, and Sidi Gaber El-Sheikh station with a percentage of 7%. [Table 3](#) shows origin destination matrix of passenger kilometer using Bakous Tram line.

The average passenger-Km for the Bakous line was 5.89 km, and each passenger could travel daily about 13 stations.

- (1) The analysis shows that the average journey time for Bakous line was 27.3 min and the fare ranged between 1.5 and 2.5 LE.
- (2) Most of the passengers used the Bakous Tram for their total journey with a percentage of 73.8%. Only 26.2% of the passengers used another mode of transport to complete their journey and were distributed on the modes as follows: 72.3% shared taxi, 12.6% for buses, 8% for taxis, and 6.9% for trains.
- (3) In the case of passengers using another mode of transport instead of Bakous Tram it was found that 74.6% of those passengers preferred using shared taxis, followed by 6.2% for private transport such as Uber and Karim, 5.2% for buses, and 4.1% for private car owners.

- (4) If the passengers use shared taxis, their average fare is 4.5 LE and the average journey time is 23.58 min as given by the passenger response to the survey. If the passengers use buses, their average fare is 4.5 LE and the average journey time is 27.33 min from the passenger's perspective. If the passengers use mini buses, their average fare is four LE and the average journey time is 20.5 min as given by passengers.
- (5) Most trips of Bakous line were for work with a percentage of 35.6%, followed by 35.3% for education, while family trips represented 12.8%.
- (6) Of the passengers, 69% are daily users while 23.5% are weekly users.
- (7) It was found that the main reason to use the Bakous line was due to the ease of use of the tram with a percentage of 34.2%, followed by three main reasons which were cheaper (19.9%), faster (17.6%), and close to origin or destination (16.4%).
- (8) The number of female passengers is 53.8%, while male passengers represent 46.2%.
- (9) About 40% of passengers for Bakous line are young-age passengers; 22% of passengers' age ranged between 21 and 30 years, followed by 20.6% with an age of less than 20 years.
- (10) Most passengers of Bakous line were private sector employees with 21.7%, followed by students either university or school students with percentages of 19 and 11.6%, respectively.
- (11) About 60% of Bakous passengers' monthly income was less than 3000 LE, because a high percentage of riders are students; 28% of passengers on this line had an income ranging from 3001 to 4000 LE. According to this 92.4% of passengers did not own a private car.
- (12) The analysis of the questionnaire showed that most trips for Bakous line were for work with a percentage of 35.6%, followed by 35.3% for education, while family trips represented 12.8%.
- (13) The majority of passengers (77.8%) for Raml Tram–Bakous line used the tram twice a day as expected, and about 36% of passengers used the Tram twice a week.

## 6. Conclusions

The main conclusions of this research are the following:

### 6.1. Conclusions related to passenger counts

The passenger count repeated in the summer days with the maximum number of passengers observed equal to 373 passenger per tram per direction for the Bakous line and 279 passenger per tram per

Table 3. Origin destination matrix of passenger kilometer using Bakous Tram line.

Stations	El-Raml	El-Qa'ed Ibrahim	Hassan Rasem (El-Azaritah)	El-Shahid Mostafa Ziean	El-Shoban El-Moslemin	El-Shatby	El-Gamaa	El-Moasker (Camp Chezar)	El-Ibrahmaya	El-Rayada - El-Soghra	El-Rayada - El-Kubra	Cleopatra El-Soghra	Cleopatra Hamamat	Sidi Gaber El-Sheikh
El-Raml	0	0	0	1920	2720	5280	2160	14,880	2860	6620	3600	3950	4190	18,480
El-Qa'ed Ibrahim	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hassan Rasem (El-Azaritah)	0	0	0	0	0	0	2160	4960	0	0	0	3950	4190	9240
El-Shahid Mostafa Ziean	960	480	0	0	0	0	6480	2480	0	3310	0	0	0	4620
El-Shoban El-Moslemin	0	0	610	0	0	0	2160	0	0	3310	0	3950	0	9240
El-Shatby	5280	0	610	0	0	0	0	0	2860	0	0	0	0	18,480
El-Gamaa	12,960	480	0	0	0	1760	0	0	0	0	0	3950	0	4620
El-Moasker (Camp Chezar)	4960	0	0	0	0	0	0	0	0	0	0	0	0	4620
El-Ibrahmaya	11,440	0	0	0	0	0	0	0	0	0	0	0	0	0
El-Rayada - El-Soghra	0	0	0	0	0	1760	0	0	0	0	0	0	0	0
El-Rayada - El-Kubra	3600	0	0	960	0	0	4320	0	0	0	0	0	0	4620
Cleopatra El-Soghra	7900	0	0	0	0	0	2160	2480	2860	0	0	0	0	0
Cleopatra Hamamat	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sidi Gaber El-Sheikh	9240	0	0	960	1360	0	2160	2480	0	0	0	3950	0	0
Mostafa Kamel	4980	0	0	0	0	0	0	0	0	0	0	0	0	0
Mohamet Mahfouz	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Roushdi	5740	0	0	0	0	0	0	0	5720	3310	0	7900	0	4620
Isis (Bokla)	12,320	0	0	960	0	0	2160	0	0	3310	0	0	0	0
El-Wazarah	6450	0	0	0	0	0	0	0	0	0	0	0	0	0
El-Karnak (Fleming)	0	0	0	960	0	0	0	2480	0	3310	0	0	0	9240
Abu Shabana (Bakous)	29,280	480	0	960	2720	5280	6480	4960	11,440	0	3600	15,800	0	9240
Safr	0	0	0	0	0	0	0	0	0	0	0	7900	0	0
Shots	16,240	0	610	2880	1360	1760	2160	4960	0	0	0	3950	0	4620
Ganaklis	8540	0	0	0	0	0	0	0	2860	0	0	3950	0	4620
San Stefano	0	0	0	0	0	0	0	0	0	0	0	3950	0	0
Tharwat	0	0	0	0	0	0	0	2480	0	0	0	0	0	4620
Loraan	0	0	0	960	0	0	0	0	0	0	0	0	0	0
El-Saraya	0	0	0	0	0	0	0	2480	0	0	0	0	0	0
Sidi Bishr	10,010	0	0	960	0	0	0	0	0	0	0	3950	0	0
El-Syouf	0	0	0	960	0	0	0	0	0	0	0	0	0	4620
El-Nasr (Victoria)	42,400	0	0	0	0	1760	0	2480	2860	3310	3600	11,850	0	0
Grand Total	192,300	1440	1830	12,480	8160	17,600	32,400	47,120	31,460	26,480	10,800	79,000	8380	115,500

Source: Conducted Survey by researchers.

direction for El Nasr line. So maximum number of passengers in summer is 373 compared to the corresponding value which is 420 passengers in school time for Bakous line. Similarly, maximum number of passengers in summer is 279 compared to the corresponding value which is 347 passengers in school time for Bakous line. Meaning that the peak demand occurs during school days. This indicates that in summer time there is a reduction in the demand on using the transit facility compared to school days. This is due to the fact that during the summer vacation there is less demand generally for using Raml Tram. In general, the passenger demand along Bakous line decreased by 11% while El Nasr line decreased by 19% during the summer.

## 6.2. Conclusions related to passenger surveys

The average number of stations for both lines is 11. The average journey time of the tram is 23 min for Nasr line and 27 min for the Bakous line.

Most passengers do not use complementary modes for both tram lines, for those passengers who use complementary modes, they use shared taxis as the main mode of transport.

For both lines, the main journey purpose is work and education. More than 50% of passengers use trams daily. With respect to the main reasons for using trams, it is because the tram is convenient and cheaper.

Regarding socioeconomic characteristics, tram users are in the young age group and mostly students, and belonging to low-income category earning less than 2000 LE; most of them do not own cars and more than 40% fall in this category.

## Funding statement

This paper part of project titled: "The alternative transportation during the Raml Tram Modernization works", in response to the TOR published to



Mostafa Kamel	Mohamet Mahfouz	Roushdi	Isis (Bokla)	El- Wazarah	El-Karnak (Fleming)	Abu Shabana (Bakous)	Safr	Shots	Ganaklis	San Stefano	Tharwat	Loraan	El- Saraya	Sidi Bishr	El- Syouf	El-Nasr (Victoria)	Grand Total
0	0	5740	6160	12,900	13,560	95,160	7690	16,240	0	8830	0	0	0	10,010	0	21,200	264,150
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	6780	7320	0	8120	0	0	0	0	0	0	0	0	46,720
0	0	0	0	0	0	7320	7690	0	0	0	0	0	0	0	0	0	33,340
0	0	0	18,480	0	0	0	0	0	0	0	0	0	0	0	0	0	37,750
4980	0	11,480	0	0	0	21,960	0	8120	17,080	0	0	0	0	0	0	0	90,850
0	0	0	12,320	0	13,560	0	7690	0	0	0	0	0	0	0	0	0	57,340
0	0	11,480	0	0	6780	21,960	0	0	0	0	0	0	0	0	0	10,600	60,400
4980	0	5740	12,320	0	0	0	7690	0	0	0	0	0	0	0	0	0	42,170
4980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6740,
0	0	0	0	0	0	7320	0	0	0	0	0	0	0	0	10,250	0	31,070
0	0	0	18,480	0	33,900	7320	0	0	0	0	0	0	0	0	0	0	75,100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	6780	7320	0	0	8540	0	0	0	0	0	0	10,600	53,390
0	0	0	0	0	0	7320	0	0	0	0	0	0	0	10,010	0	0	22,310
0	0	0	0	0	0	7320	0	0	0	0	0	0	0	0	0	0	7320
0	0	0	0	0	6780	14,640	0	0	0	0	0	0	0	0	0	0	48,710
0	0	0	0	0	0	14,640	0	0	0	0	0	0	0	0	0	21,200	54,590
4980	0	0	6160	0	0	0	0	0	0	0	0	0	0	0	0	10,600	28,190
0	0	0	0	0	0	0	0	8120	0	8830	0	0	0	0	0	42,400	75,340
9960	0	22,960	6160	0	0	0	0	8120	17,080	8830	9070	47,100	0	0	20,500	10,600	250,620
4980	0	0	36,960	0	0	0	0	8120	0	0	0	0	0	30,030	10,250	0	98,240
0	0	5740	0	0	0	7320	0	8120	8540	0	9070	0	0	20,020	20,500	21,200	139,050
0	0	0	0	0	6780	0	0	0	0	0	0	0	0	0	0	0	26,750
0	0	0	0	0	0	0	0	8120	0	0	0	0	0	0	0	10,600	22,670
0	0	0	6160	0	0	0	7690	0	0	0	0	0	0	0	0	0	20,950
0	0	0	0	0	0	21,960	0	0	0	8830	0	0	0	0	0	0	31,750
0	0	0	0	0	0	21,960	0	0	0	0	0	0	0	0	0	10,600	35,040
0	0	0	0	0	0	14,640	0	16,240	0	0	0	0	0	0	0	10,600	56,400
0	0	0	0	0	0	14,640	0	8120	8540	8830	0	0	0	0	0	21,200	66,910
0	0	5740	12,320	0	13,560	51,240	30,760	16,240	8540	8830	18,140	0	19,520	20,020	0	0	273,170
34,860	0	68,880	135,520	12,900	108,480	351,360	69,210	113,680	68,320	52,980	36,280	47,100	19,520	90,090	61,500	201,400	2,057,030

the Egyptian National Institute of Transport (ENIT) by the National Authority for Tunnels (NAT).

### Authors contribution

Hassan Mahdi: Conception or design of the work, Project administration, Supervision, and Final approval of the version to be published.

Raghdaa Al-Mahdi: Conception or design of the work, Data collection and tools, Data analysis and interpretation, Investigation, Methodology, Resources, Software, Supervision, and Drafting the article.

Amir Al Samman: Data collection and tools, Data analysis and Interpretation, Resources, Project administration, and Supervision.

Enas Nashed: Conception or design of the work, Data collection and tools, Data analysis and interpretation, Investigation, Methodology, Software, and Critical revision of the article.

Noor Elmitiny: Conception or design of the work, Data collection and tools, Data analysis and

interpretation, Investigation, Methodology, Resources, Software, Supervision, and Critical revision of the article.

Yousra El Gohary: Conception or design of the work, Data collection and tools, Data analysis and interpretation, Methodology, Resources, Supervision, and Drafting the article.

Mohamed Gharieb: Conception or design of the work, Data collection and tools, Data analysis and interpretation, Investigation, Methodology, Software, and Supervision.

Ahmed Elmahyli: Data collection and tools, Data analysis and interpretation, Resources, Software, and Drafting the article.



Zainab Taha: Data collection and tools, Data analysis and interpretation, Resources, and Software.

Abdalla Kandil: Data collection and tools, Data analysis and interpretation, Resources, and Software.

### Conflicts of interest

There is no conflict of interest.

## Appendix 1. Boarding and Alighting Nasr Line Survey Form in English.

	<b>The Alternative Transportation during the Raml Tram Modernization Works Project</b>	
<b>Passengers Count Form</b>		
Name of The Enumerator:		Date: / /2023
Line:	El-Nasr Line	

The Starting Station of The Trip	El-Raml	Tram Departure Time	
The End Station of The Trip	El- Nasr	Tram Arrival Time	

No. of Station	Name of Station	Arrival Time	Departure Time		Boarding No.		Alighting No.
1	El-Raml						
2	El-Qa'ed Ibrahim						
3	Hassan Rasem (El-Azaritah)						
4	El-Shahid Mostafa Zlean						
5	El-Shoban El-Moslemin						
6	El-Shatby						
7	El-Gamaa						
8	El-Moasker (Camp Chezar)						
9	El-Ibrahmaya						
10	El-Rayada - El-Soghra						
11	El-Rayada - El-Kubra						
12	Cleopatra						
13	Sidi Gaber - El-Mahata						
14	Mostafa Kamel						
15	Mohamet Mahfouz						
16	Roushdi						
17	Isis (Bokla)						
18	El-Hadaya						
19	El-Boustan (Saba Pasha)						
20	Ramsis (Gelym)						
21	El Fonoon El-Gamila						
22	Qasr El-Safa (Zizinia)						
23	San Stefano						
24	Tharwat						
25	Loraan						
26	El-Saraya						
27	Sidi Bishr						
28	El-Syouf						
29	El-Nasr (Victoria)						

## Appendix 2. Boarding and Alighting Nasr Line Survey Form in Arabic.



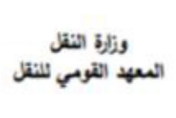
		مشروع المسارات البديلة لترام الرمل استمارة حصر ركاب الترام				
٢٠٢٣/٧/١٦		التاريخ		أسم القائم بالحصر /		
				الخط: ترام النصر		
		الرمل		محطة بداية الرحلة		
		فيكتوريا		محطة نهاية الرحلة		
		وقت قيام الترام				
		وقت وصول الترام				
عدد الصعود		عدد النزول	وقت القيام	وقت الوصول	أسم المحطة	رقم المحطة
					الرمل	١
					جامع ابراهيم	٢
					حسن راسم	٣
					الشهيد مصطفى زيان	٤
					الغبان المسلمين	٥
					الشاطبي	٦
					الجامعة	٧
					المعسكر	٨
					الإبراهيميه	٩
					اسبورتينج الصغري	١٠
					اسبورتينج الكبرى	١١
					كيلوباترا	١٢
					سيدي جابر المحطة	١٣
					مصطفى كامل	١٤
					محمد محفوظ	١٥
					رشدي	١٦
					بولكلي	١٧
					الهدايه	١٨
					البمنتان (سايا باشا)	١٩
					رمسيس (جليم)	٢٠
					الفنون الجميله	٢١
					قصر الصفا (زيزينيا)	٢٢
					سان استيفانو	٢٣
					ثروت	٢٤
					لوزان	٢٥
					السرايا	٢٦
					سيدي بشر	٢٧
					السيوف	٢٨
					فيكتوريا	٢٩

## Appendix 3. Survey form in English.

 		مشروع المسارات البديلة لترام الرمل استمارة حصر ركاب الترام			
٢٠٢٣/٧/١٦	التاريخ	أسم القائم بالحصر /			
		الخط:	ترام النصر		
		محطة بداية الرحلة	الرمل		
		محطة نهاية الرحلة	فيكتوريا		
		وقت قيام الترام	وقت وصول الترام		
عدد الصعود	عدد النزول	وقت القيام	وقت الوصول	أسم المحطة	رقم المحطة
				الرمل	١
				جامع ابراهيم	٢
				حسن راسم	٣
				الشهيد مصطفى زيان	٤
				الضبان المسلمين	٥
				الشاطبي	٦
				الجامعة	٧
				المعسكر	٨
				الإبراهيميه	٩
				اسبورتينج الصغيري	١٠
				اسبورتينج الكبرى	١١
				كيلوباترا	١٢
				سيني جابر المحطة	١٣
				مصطفى كامل	١٤
				محمد محفوظ	١٥
				رشدي	١٦
				بولكلي	١٧
				الهدايه	١٨
				البستان (سابا باشا)	١٩
				رمسيس (جليم)	٢٠
				الفنون الجميله	٢١
				قصر الصفا (زيزينيا)	٢٢
				سان استيفانو	٢٣
				ثروت	٢٤
				لوزان	٢٥
				السرايا	٢٦
				سيني بشر	٢٧
				الميواف	٢٨
				فيكتوريا	٢٩



## Appendix 4. Survey form in Arabic.

				
محافظة الإسكندرية هيئة النقل العام بالإسكندرية		المعهد القومي للنقل Egyptian National Institute of Transport (ENIT) - Egypt		وزارة النقل المعهد القومي للنقل
يقوم المعهد القومي للنقل بالتعاون مع هيئة النقل العام بالإسكندرية وبتمويل من الهيئة القومية للاتفاق- وزارة النقل بإجراء استبيان لخصائص مستخدمي ترام الرمل بالإسكندرية، تفضلاً للمعاونة في استكمال هذا الاستبيان				
استبيان لخصائص مستخدمي ترام الرمل بالإسكندرية				
المحطة	وقت المقابلة	التاريخ		
الخط □ ترام ١ باكوس □ ترام ٢ النصر □ الترام الأصفر □ الاتجاه □ الرمل □ فيكتوريا □				
أولاً) بيانات عن الرحلة الحالية/ أو آخر رحلة قمت بها مستخدماً ترام الرمل				
١. محطة الركوب..... ٢. محطة النزول..... ٣. تحديد بداية وقت الرحلة: ..... □ صباحاً □ مساءً ٤. زمن الرحلة بالترام..... ٥. التعريف..... جنيه ٦. هل يتم تكملة الرحلة بوسيلة أخرى قبل وبعد الترام □ نعم □ لا □ إذا كانت الإجابة بنعم حدد الوسيلة المكمل لرحلة الترام.....				
ثانياً) الوسيلة البديلة للرحلة الحالية:				
٧. ما الوسيلة البديلة للترام التي تستخدمها في حالة عدم ركوب الترام: □ سيارة خاصة □ النقل الخاص (مثل كريم/ أوبر...) □ التاكسي □ مشرّع/ سرفيس □ محطة الركوب..... محطة النزول..... التنكزة..... زمن الرحلة..... □ أتوبيس □ محطة الركوب..... محطة النزول..... التنكزة..... زمن الرحلة..... □ ميني باص/ ميكروباص □ محطة الركوب..... محطة النزول..... التنكزة..... زمن الرحلة.....				
ثالثاً) بيانات عن استخدام ترام الرمل بصفة عامة				
٨. الغرض من استخدامك الترام (يسمح بتعدد الإجابات) □ العمل □ الدراسة □ الزيارات العائلية □ التسوق □ أخرى (انكرها.....)				
٩. كم عدد المرات التي تستخدم بها الترام: ..... مرة كل □ يوم □ أسبوع □ شهر □ سنة ١٠. لماذا تفضل استخدام الترام: .....				
ثالثاً) الخصائص الاقتصادية والاجتماعية للمستخدم:				
١١. النوع □ ذكر □ أنثى ١٢. العمر □ أقل من ٢٠ سنة □ ٢١-٣٠ □ ٣١-٤٠ □ ٤١-٥٠ □ أكبر من ٦٠ سنة ١٣. الوظيفة □ موظف حكومي □ موظف قطاع خاص □ طالب جامعي □ طالب قبل الجامعي □ بدون عمل □ أخرى (انكرها.....) ١٤. ما هو دخلك الشهري تقريباً؟ □ أقل من ١٠٠٠ جنيه □ ١٠٠٠ - ٢٠٠٠ جنيه □ ٢٠٠٠ - ٣٠٠٠ جنيه □ ٣٠٠٠ - ٤٠٠٠ جنيه □ ٤٠٠٠ - ٥٠٠٠ جنيه □ أكثر من ٦٠٠٠ جنيه ١٥. هل تمتلك سيارة خاصة؟ □ نعم □ لا				

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